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Visual attention to advertising

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Published in:
Journal of Consumer Research

Publication date:
1997

[Link to publication in Tilburg University Research Portal](#)

Citation for published version (APA):
Rosbergen, E., Pieters, R., & Wedel, M. (1997). Visual attention to advertising: A segment-level analysis. *Journal of Consumer Research*, 24(3), 305-314.

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The Journal of Consumer Research, Vol. 24, No. 3. (Dec., 1997), pp. 305-314.

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Visual Attention to Advertising: A Segment-Level Analysis

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RIK PIETERS
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We propose a methodology to study the effects of physical ad properties on consumers' visual attention to advertising that accounts for heterogeneity in these effects across consumers. In an illustrative experiment, we monitor consumers' eye movements during naturalistic exposure to a consumer magazine, in which experimentally designed ads are inserted. A latent class regression model accounting for heterogeneity across consumers through unobserved segments is used to analyze the eye movement data in detail. Three consumer segments are identified that exhibit distinct patterns of visual attention as well as different profiles of product involvement, brand attitude, and advertising recall. Implications for visual attention theory and for advertising research are discussed.

I believe that today visibility, sheer visibility, is more important than it's been, speaking of printed advertising and that applies to television, of course, too. (LEO BURNETT, in Higgins 1965)

Over 20 years ago, Britt, Adams, and Miller (1972) demonstrated that, on average, consumers are exposed to between 300 and 600 commercial messages daily. As competition for consumers' limited attention is of even greater concern in today's crowded markets and media, it is important to understand how and when consumers devote attention to commercial stimuli and what determines their attentional strategies and patterns (see, e.g., Miniard et al. 1991). The importance of attention has been acknowledged in most advertising-processing models (Rossiter and Percy 1983), but "despite the tremendous amount of money spent on buying consumer attention, little to no research is done on consumer attention" (Janiszewski and Bickart 1994, p. 329).

Capacity theories of attention (see, e.g., Broadbent 1971; Kahneman 1973) as well as information-processing models (see, e.g., Greenwald and Leavitt 1984; MacInnis and Jaworski 1989) assume that the attention allocated to an ad is a function of consumers' motivation, opportunity, and ability, which are affected by, for instance, physical properties of the advertisement and consumers' characteristics. In fact, physical ad properties, or those properties that make up the observable advertising message, such as headline, copy block, illustrations, size, and so forth (Assael, Kofron, and Burgi 1967), are considered to play a central role in attracting consumers' attention (see, e.g., Rossiter 1982; Soley and Reid 1983). Current insights into the impact of physical ad properties on attention are scarce and largely based on research using memory measures (Kroeber-Riel 1993).

Results of memory research, however, cannot be easily generalized to the domain of attention to advertising, because memory scores are limited indicators of attention to advertising (see, e.g., Appel and Blum 1961; Baddeley 1990). Kellogg (1980) showed that attention need not even be active or "conscious." Therefore, physiological responses to advertising may be more reliable measures of attention than self-reports or memory scores (Krugman 1965). One such physiological response, visual attention, is conceptualized as "a brain operation producing a localized priority in information processing—an attentional 'window' or 'spotlight' that locally improves the speed and reduces the threshold for processing events" (Deubel and Schneider 1993, p. 575) and is obtained with the use of eye tracking (Krugman et al. 1994; Tsal and Lavie 1993; Van der Heijden 1992). A prominent, aggregated measure of eye-movement data is gaze duration, which

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is defined as the sum of fixation durations on a stimulus element or on the stimulus as a whole. Research demonstrates the validity of gaze duration as an indicator of visual attention (e.g., Christianson et al. 1991).

Besides the limited value of memory scores as an indicator for attention, memory research as such has been questioned for a number of reasons. First, the approaches chosen are predominantly data-analytic "without recognition of the danger of drawing causal inferences" (Finn 1988, p. 168). Second, because of the use of data for various advertisements, "ad characteristics are confounded with uncontrolled and unmeasured contextual factors (e.g., type of magazine, time and place of exposure, product relevance to the consumer) so it is difficult to evaluate the separate effects of these characteristics on effectiveness" (Burke and DeSarbo 1987, p. 93). For instance, Appel and Blum (1961) showed that false claiming of recognition increases with interest in the product being advertised. Finally, the impact of physical ad properties has been determined across all subjects in the sample, whereas individual differences between subjects are likely to moderate this impact (see, e.g., Shanteau 1983). In fact, previous research has reported substantial differences in overall attention to advertising among consumers (e.g., Celsi and Olson 1988), which suggests that segments of consumers may respond differently to the physical properties of advertisements. Because aggregating heterogeneous responses may mask the actual relationships between the physical ad properties and attention, analyses of such aggregate relationships may be incorrect and potentially misleading. However, a systematic study of (the causes of) heterogeneity in the effects of physical ad properties on attention has yet to be performed.

This article proposes a methodology to examine the impact of physical properties of print advertisements on visual attention to advertising that accounts for consumer heterogeneity. That is, segments of consumers that respond differently to the physical ad properties are identified on the basis of local gaze duration patterns. Those emerging segments can then be described by relevant consumer characteristics.

Usefulness of the methodology will be illustrated on the basis of a study in which visual attention to experimentally designed print advertisements is measured in a setting that resembles a regular advertising exposure situation, such that attention is uninstructed and subjects control their exposure to the ads. Instructing the subjects to perform a certain task related to the advertisement might unintentionally increase their motivation to process the ad, which would reduce the generalizability of the results to real-world advertising situations (Russo and Leclerc 1994). Besides, research shows that average exposure durations to advertisements tend to be significantly shorter when consumers control exposure (e.g., Kiss and Wettig 1972) than when experimenters control exposure (Janiszewski 1993; Kroeber-Riel 1984). Moreover, control over the exposure duration may affect not only the duration itself but patterns of visual attention as well.

A LATENT CLASS REGRESSION MODEL FOR VISUAL ATTENTION TO ADVERTISING

Conventional statistical techniques that have been used to analyze gaze duration data, including *t*-tests, ANOVAs, or standard regression analyses, assume that (1) gaze durations are normally distributed, and (2) subjects are homogeneous in their visual attention to advertisements. If one or both of these assumptions are violated, the explanatory power of the statistical technique is reduced, and the likelihood of drawing wrong conclusions is increased. Latent class regression models have been shown to be effective tools to examine behavioral heterogeneity between unobserved consumer segments (Wedel and DeSarbo 1994). This article proposes a latent class regression model that simultaneously estimates the effects of physical ad properties on visual attention for different segments and the probability that a subject belongs to a particular segment. The model explains the gaze duration of subject *i* ($i = 1, \dots, 115$) for ad element *j* ($j = 1, \dots, 4$), represented by y_{ij} , from the physical properties of this element, represented by $x_j = (x_{jp})$ ($p = 1, \dots, P$). It assumes that subjects are drawn from a population that consists of a number of segments, *S*, in proportions π_1, \dots, π_S , and that segment membership of subjects is unknown a priori. For the probabilities π_s it holds:

$$\sum_{s=1}^S \pi_s = 1, \quad \pi_s \geq 0 \quad (s = 1, \dots, S). \quad (1)$$

The model further assumes that fixation durations follow an exponential distribution or, in other words, that the termination rate of a fixation is constant. This assumption is supported empirically by the limited impact of a specific fixation on the start and length of a subsequent saccade, as well as by the small variance that is found in fixation durations (see, e.g., Haber 1976). Given the exponentially distributed fixations, the gaze duration, y_{ij} , which is the sum of a number of fixations, is gamma distributed (McGill and Gibbon 1965). Hence, given that y_{ij} comes from segment *s*, the conditional probability density function of y_{ij} (adding 50 milliseconds if y_{ij} is equal to zero), represented by $G_{ij|s}$ takes the following form:

$$G_{ij|s}(y_{ij} | \mu_{j|s}, v_s) = \frac{1}{\Gamma(v_s)} \left(\frac{v_s}{\mu_{j|s}} \right)^{v_s} y_{ij}^{(v_s-1)} \exp\left(-\frac{v_s y_{ij}}{\mu_{j|s}}\right), \quad (2)$$

where $\Gamma(\cdot)$ is the gamma function, v_s is the shape parameter of the gamma distribution for segment *s* ($v_s > 0$), and $\mu_{j|s}$ is the conditional expectation of the gamma distribution (i.e., the expected time a subject attends to ad element *j*, given that she belongs to segment *s*).

The conditional expectation, $\mu_{j|s}$, is modeled as a log-linear function of a constant term, x_{j0} , the physical ad properties, x_{jp} , and the parameter vector $\beta_s = (\beta_{ps})$:

$$\log \mu_{j|s} = \sum_{p=0}^P x_{jp} \beta_{ps}. \quad (3)$$

The log-linear function is used because it ensures positivity of the expected gaze durations, which is logically consistent. The unconditional simultaneous probability density function of the four observations for subject i , y_i , $f_i(y_i)$, can now be expressed as a function of the parameters π_s , β_s , and v_s :

$$f_i(y_i | \Phi) = \sum_{s=1}^S \pi_s \prod_{j=1}^4 G_{ij|s}(y_{ij} | \beta_s, v_s), \quad (4)$$

where $\Phi = (\pi_1, \dots, \pi_S, \beta_1, \dots, \beta_S, v_1, \dots, v_S)$. The purpose is to obtain estimates for both the parameter vector Φ and the posterior probability that subject i belongs to segment s . For a prespecified value of S , the estimates are obtained by maximizing the likelihood of the model,

$$L = \prod_{i=1}^{115} f_i(y_i | \Phi), \quad (5)$$

using an EM algorithm (Dempster, Laird, and Rubin 1977; see also Wedel and DeSarbo 1994). The posterior membership probability that subject i belongs to segment s , α_{is} , can be calculated on the basis of the estimated parameters, according to:

$$\hat{\alpha}_{is} = \frac{\hat{\pi}_s \prod_{j=1}^4 G_{ij|s}(y_{ij} | \hat{\beta}_s, \hat{v}_s)}{\sum_{s=1}^S \hat{\pi}_s \prod_{j=1}^4 G_{ij|s}(y_{ij} | \hat{\beta}_s, \hat{v}_s)} \quad (6)$$

The appropriate number of segments S , which is usually unknown a priori, is determined by optimizing the likelihood for different values of S and comparing the values of Bozdogan's (1987) Consistent Akaike's Information Criterion (CAIC). The optimum value of S is the value that minimizes CAIC.

The following experiment demonstrates the usefulness of the latent class regression model by showing how the impact physical ad characteristics on visual attention to advertising may differ across consumer segments.

EXPERIMENT

Subjects

One hundred and fifteen female consumers, aged 20–39, were randomly selected. All subjects were regular readers of women's magazines, and none wore glasses or contact lenses. Subjects were invited to come to the office of a market research company in the Netherlands, where the experiment took place. The experiment lasted approximately half an hour, and subjects were paid the equivalent of \$10 for their participation.

Materials

In order to investigate the effects of physical properties of advertisements, four different versions of an advertise-

ment for an existing brand of shampoo were professionally designed by an advertising agency. Each version contained four elements: a pictorial (i.e., a picture of a female with long hair), a body text, a headline, and a packshot (i.e., a picture of a shampoo bottle). The four versions contained an identical message, but they differed with respect to the position and the amount of space allocated to the four elements of the advertisement and with respect to the background color of the headline. The text of the headline is: "So good, so soft, so natural, it's Schwarzkopf's familiar seven herbs shampoo." The body text mentions that seven herbs shampoo provides everything the hair needs and that it ensures natural, beautiful hair. The text subsequently introduces the other Schwarzkopf shampoos. Figure 1 presents the four versions of the advertisement as used in the study.

The four elements within each ad version are described in terms of seven variables representing the physical properties of those elements: SIZE, indicating the size of an element in hundreds of square centimeters; dummy variables PICTORIAL, PACKSHOT, and HEADLINE, which take the value 1 if the element contains the pictorial, the packshot, or the headline respectively, and 0 otherwise (in this way, the constant term will indicate the amount of attention that is paid to the body text); RIGHT, indicating whether the element connects to the right margin of the page (1) or not (0); UPPER, indicating whether the element is in the upper half of the page (1) or not (0); and COLOR, indicating whether the element is in full color (1) or in black-and-white (0). The values of the seven properties for the four ad versions are presented in Table 1.

Each version of the advertisement was professionally inserted in a specially developed issue of a popular Dutch weekly women's magazine. The ads were positioned on page 25, and the magazine contained six ads for different products before and 36 ads after the target ad. Each subject read only one of the four versions of the magazine, which were identical except for the target advertisement. Subjects were randomly assigned to one of the four versions: 26 subjects were exposed to version 1, 29 to version 2, 29 to version 3, and 31 to version 4.

Procedure

Upon entering the experimental room, subjects were informed that the study concerned "the way people read and use magazines," and that their eye movements would be recorded while they were leafing through and reading a women's magazine. Subjects were asked to use the magazine as they normally would at home, starting at page 1. Upon reaching page 31, six pages after the location of the target advertisement in the magazine, subjects were asked to stop reading. None of the subjects were aware of the goal of the study.

To allow eye-tracking, subjects placed their chin on a small, comfortable chin rest after being seated. The magazine was in front of them on a small stand. Eye move-

FIGURE 1
FOUR VERSIONS OF THE ADVERTISEMENT



Version 1



Version 2



Version 3



Version 4

NOTE.—These four versions, which were especially designed for this experiment, are based on an older advertisement for Schwarzkopf shampoo.

ments were recorded by infrared scleral reflection. An infrared camera was located toward the left side of the subjects, so as not to interfere with the subjects' normal reading behaviors. A semitransparent sheet of special glass between the stand and the subject's eyes, close to

the stand, allowed infrared rays to reflect off the surface of the subject's right eye while measuring the position of the pupil. Subjects could see through the sheet of glass, and it did not hinder them in leafing through the magazine.

After an explanation of the eye-tracking system, cali-

TABLE 1
VALUE OF THE PHYSICAL PROPERTIES FOR THE DIFFERENT AD ELEMENTS

Advertisement	Size ($\times 100 \text{ cm}^2$)	Pictorial	Packshot	Headline	Right	Upper	Color
Version 1:							
1. Pictorial	3.56	1	0	0	1	1	1
2. Packshot	.45	0	1	0	1	0	1
3. Headline	.44	0	0	1	0	0	0
4. Body text	1.15	0	0	0	0	0	0
Version 2:							
1. Pictorial	2.78	1	0	0	1	1	1
2. Packshot	.89	0	1	0	1	0	1
3. Headline	.72	0	0	1	1	1	1
4. Body text	1.30	0	0	0	0	0	0
Version 3:							
1. Pictorial	1.72	1	0	0	0	1	1
2. Packshot	2.11	0	1	0	1	0	1
3. Headline	.88	0	0	1	1	1	0
4. Body text	1.14	0	0	0	0	0	0
Version 4:							
1. Pictorial	2.41	1	0	0	1	1	1
2. Packshot	.83	0	1	0	1	0	1
3. Headline	.86	0	0	1	0	0	1
4. Body text	1.30	0	0	0	0	0	0

bration to the subject's eye took place. The system recorded the distance and angle between the infrared reflection and the center of the pupil 50 times a second and simultaneously converted this distance and angle into an x, y location. By relating the x, y locations to the position of the four ad elements, fixation locations were determined. To account for measurement unreliability, five successive measurements of the eye-tracking system were joined, yielding a unit of measurement of gaze duration of 100 milliseconds, which is still substantially shorter than the average fixation duration, reported to be about 0.27 seconds on average (see, e.g., Kroeber-Riel 1993). The eye-tracking data were aggregated to yield gaze durations for each of the ad elements.

Additional Measures

After the eye-tracking experiment, additional verbal measures were taken by personal interviews and self-completion questionnaires.

Ad Recall. Unaided advertising recall ("Please name the brand and the product of the advertisements that you have seen"), and advertising recognition ("Do you remember having seen this advertisement?") were assessed first by female interviewers, who were unaware of the goal of the study.

Attitude toward the Advertisement. Attitude toward the advertisement was assessed by averaging the scores of three five-point items, which were worded as follows: "Please indicate what your opinion is of the Schwarzkopf advertisement" (anchored by "not worth watching/

worth watching," "unattractive/attractive," "bad/good"; Cronbach's $\alpha = 0.77$).

Shampoo Usage Frequency and Familiarity. Shampoo usage frequency was measured by asking subjects how many times a week they shampooed their hair. To measure their familiarity with the shampoo category, subjects were asked to write down all the shampoo brands they knew. Familiarity was operationalized as the number of brands mentioned by each subject.

Product Involvement. To measure product involvement, we used the New Involvement Profile proposed by Jain and Srinivasan (1990). This measure synthesizes earlier single-component (see, e.g., Zaichkowski 1985) and multicomponent measures (see, e.g., Laurent and Kapferer 1985), and it is in line with recent findings in social psychology about different components of involvement (Johnson and Eagly 1989). The New Involvement Profile is a 15-item scale that measures five components of product involvement: sign, relevance, pleasure, risk probability, and risk importance. A confirmatory factor analysis (Jöreskog and Sörbom 1989) revealed that the five-dimensional model fits the data rather well, although the χ^2 -statistic is significant ($\chi^2(67) = 87.75, p = .045$; goodness-of-fit index = 0.90). Construct reliabilities of all five components ranging from 0.66 for pleasure to 0.87 for sign were satisfactory, and the five components were uncorrelated. Scores on the five components were calculated by averaging the scores on the appropriate items.

Attitude toward the Brand. Following the work of Batra and Ahtola (1991), we assessed attitude toward

TABLE 2
LOG-LIKELIHOOD AND CAIC STATISTICS
FOR MODEL SELECTION

Number of segments (<i>S</i>)	Log-likelihood (ln <i>L</i>)	CAIC
1	-63.56	177.04
2	-16.32	139.61
3	23.13	118.61 ^a
4	43.63	133.81
5	64.46	149.21

^aDenotes minimum CAIC value.

the brand with two measures. The first measure assessed utilitarian brand attitude by averaging the scores of three five-point items, which were worded as follows: "To me Schwarzkopf is . . ." (anchored by "good/bad," "value for money/no value for money," "high quality/low quality"; $\alpha = 0.85$). In addition, hedonic brand attitude was measured by the average of three five-point items, which were worded as follows: "To me Schwarzkopf is . . ." (anchored by "luxury/regular," "expensive/cheap," "chic/normal"; $\alpha = 0.69$).

RESULTS

The fact that gaze durations for the ad as a whole do not differ across ad versions ($F(3, 111) = 0.73, p = .54$) indicates that our manipulation of the target ad is not confounded with individual differences in visual attention. Standard regression analysis shows that HEADLINE is the only physical ad property that has a significant impact on local gaze durations ($\beta = 0.328, t = 2.28$), but inspection of the distribution of local gaze durations indicates that the assumption of normality is violated. For instance, 69 out of 115 subjects gazed for less than 0.1 seconds at the body text. Subsequent lognormal and gamma regression analyses, which account for such skewed distributions, also suggest that only HEADLINE has a significant impact on local gaze duration.

In addition, accounting for individual differences by segmenting the subjects on the basis of their local gaze durations using conventional hierarchical and nonhierarchical clustering algorithms does not improve the explanatory power of the physical ad properties. In fact, the algorithms subdivide the subjects into one large segment and a number of small segments. For those latter segments, the impact of the physical ad characteristics on visual attention cannot be estimated because of insufficient observations.

Next, the latent class regression model is estimated for $S = 1$ to $S = 5$. To increase the likelihood of obtaining a global optimum, the estimation procedure was repeated with 20 different random starting values of α_{is} . Table 2 shows that the CAIC statistic is minimal for $S = 3$. The optimal $S = 3$ solution is found in 10 out of

the 20 random starts, which strongly suggests that a global optimum is reached. The (adjusted) \bar{R}^2 for the $S = 3$ solution is 35.4 percent, over six times more than the \bar{R}^2 for the aggregate ($S = 1$) solution, which is 4.7 percent, which underlines the strong heterogeneity in the effects of exogenous factors on visual attention and therefore the relevance of distinguishing segments of consumers. Cross-tabulation of ad versions by consumer segments, with consumers being allocated to the segment for which their estimated membership, $\hat{\alpha}_{is}$, was highest, was nonsignificant ($\chi^2(6) = 4.51, p = .61$), which rules out the possibility that the three consumer segments represent in some way the four ad versions that we used.

Estimated effects of the physical ad properties on gaze duration for each of the segments of the $S = 3$ solution are presented in Table 3. The mixing proportions, given in the bottom row of the table, indicate the size of the segments. For comparison, Table 3 presents the aggregate ($S = 1$) solution as well. Inspection of the table once more reveals the incorrect conclusions that would have been drawn about the impact of physical ad properties on visual attention if this impact had been assumed to be homogeneous across consumers. In the aggregate ($S = 1$) solution, only a single physical ad property, HEADLINE, significantly affects local gaze duration. By contrast, in the $S = 3$ solution, four physical ad properties have a significant impact on local gaze duration for segment 1, six properties for segment 2, and two properties for segment 3.

Table 4 provides the *mean actual* gaze duration for the pictorial, packshot, headline, and body text for each of the three segments separately as well as for the total sample (differences between the segments were tested using gamma-regression models). The results reported in Tables 3 and 4 together provide a concise description of the patterns of local gaze duration for each of the segments. For subjects in segment 1, the smallest of the three segments (23.2 percent of the sample), gaze durations were the shortest (0.633 seconds on average; Table 4). Their attention was divided equally between the pictorial and the headline of the advertisement, whereas the packshot and body text received virtually no attention. Parameter estimates for HEADLINE, PICTORIAL, and PACKSHOT in Table 3 support these findings, where the negative and significant PACKSHOT parameter indicates that attention for the packshot of the advertisement was even less than for the body text. Subjects in segment 1 appeared to be "scanning" the advertisement, since they attended only to elements that were likely to provide an overview or summary of the content of the advertisement, such as the pictorial and the headline (Finn 1988; Greenwald and Leavitt 1984). Table 3 further shows that this segment paid more attention to the right and upper half of the page, and that full-color and black-and-white elements received the same amount of attention.

The subjects in segment 2 (24.3 percent of the sample) paid significantly more attention (1.013 seconds total on

TABLE 3
MODEL ESTIMATES OF THE PHYSICAL AD PROPERTIES ON LOCAL GAZE DURATION
FOR THE AGGREGATE SOLUTION AND PER SEGMENT

Ad characteristic	Aggregate (S = 1) solution	(S = 3) solution		
		Segment 1 (scanning)	Segment 2 (initial attention)	Segment 3 (sustained attention)
Constant	-1.470 (-6.67)***	-2.789 (-23.92)***	-3.132 (-26.57)***	-.968 (-4.76)***
Size	.283 (1.84)	-.122 (-1.48)	.122 (1.49)	.335 (2.38)*
Pictorial	.300 (.69)	.239 (1.09)	4.705 (19.77)***	-.312 (-.76)
Packshot	-.006 (-.01)	-.586 (-2.59)*	1.424 (5.68)***	-.381 (-.92)
Headline	.681 (2.66)**	.324 (2.38)*	2.566 (19.17)***	.337 (1.41)
Right	.573 (1.78)	.551 (3.37)**	.579 (3.23)**	.721 (2.45)*
Upper	-.377 (-.97)	1.352 (6.91)***	-2.858 (-13.34)***	-.414 (-1.16)
Color	-.277 (-1.19)	-.039 (-.33)	-.293 (-2.26)*	-.175 (-.80)
Mixing proportion	1.000	.232	.243	.525

NOTE.—*t* values are in parentheses.

**p* < .05.

***p* < .01.

****p* < .001.

TABLE 4
MEAN ACTUAL GAZE DURATION PER AD ELEMENT AND PER SEGMENT (IN SECONDS)

Ad element	Aggregate	Segment 1 (scanning)	Segment 2 (initial attention)	Segment 3 (sustained attention)
Pictorial	.547	.330 ^a	.436 ^a	.711 ^b
Packshot	.402	.000 ^a	.252 ^b	.674 ^c
Headline	.523	.300 ^a	.326 ^a	.735 ^b
Body text	.295	.004 ^a	.000 ^a	.593 ^b
Overall	1.766	.633 ^a	1.013 ^b	2.712 ^c

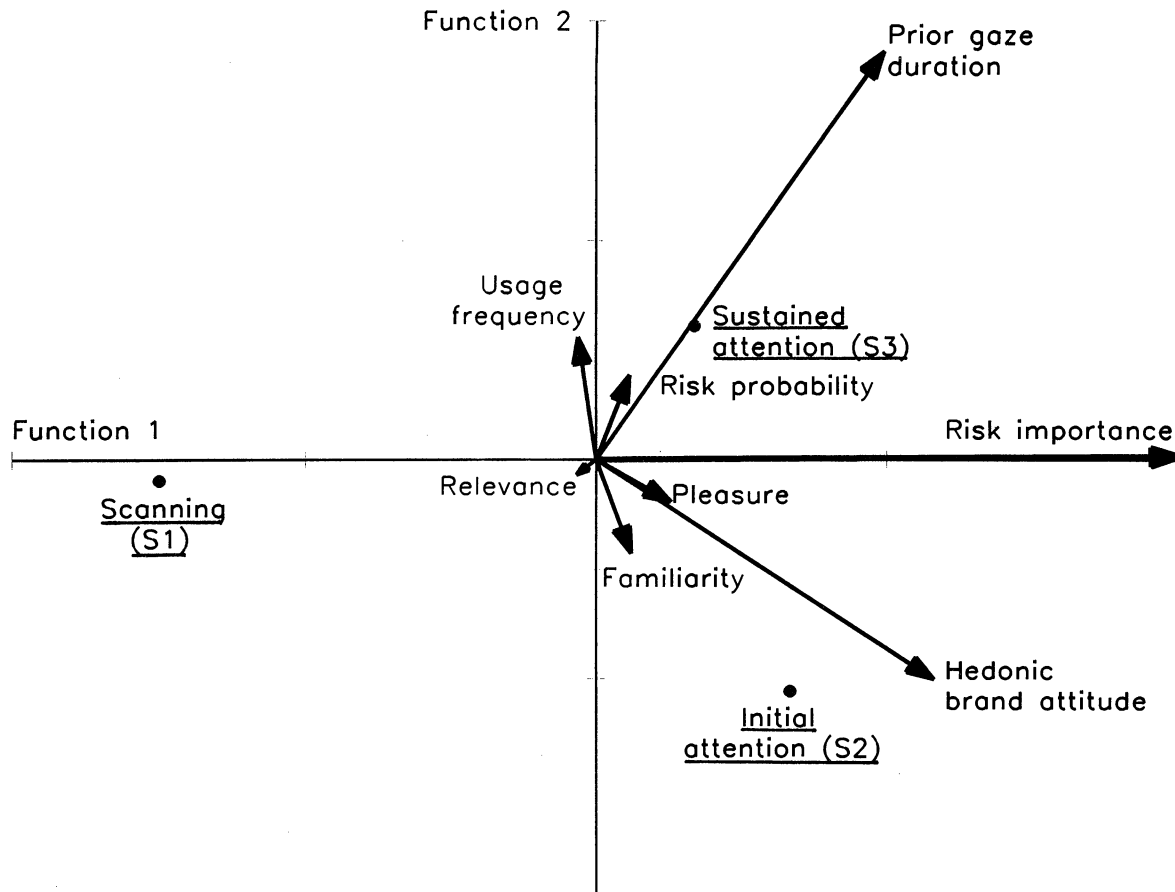
NOTE.—Means in a given row with the same superscript letter are not significantly different at *p* < .05, while means with different superscripts are significantly different at *p* < .05.

average) to the advertisement than those in segment 1. The largest part (43 percent) of this attention was devoted to the pictorial. The headline and the packshot received, respectively, 32 and 25 percent of the attention, whereas the body text received no attention at all. This finding is supported by the positive and significant parameter estimates for PICTORIAL, PACKSHOT, and HEADLINE. The gaze pattern of subjects in segment 2 appears to be indicative of "initial attention" for the advertisement. Table 3 further shows that local gaze durations of these subjects were longer for ad elements on the right and lower half of the page, and for ad elements in black-and-white.

Finally, subjects belonging to segment 3 (52.5 percent of the sample) had the longest gaze duration

(2.712 seconds on average). The nonsignificant parameter estimates for the variables PICTORIAL, PACKSHOT, and HEADLINE show that these subjects divided their attention equally between pictures (pictorial and packshot) and text (headline and body text), indicating "sustained attention" for the advertisement. In fact, local gaze duration was affected only by the size of the elements, where larger elements received more attention, and by the position of the elements (i.e., elements on the right side of the page received more attention than elements on the left side). Whether or not elements were part of the upper half of the page and whether elements were in full color or in black-and-white did not affect local gaze durations for subjects belonging to segment 3.

FIGURE 2
DISCRIMINANT SPACE WITH SEGMENTS AND CONSUMER CHARACTERISTICS



Next, the three segments are described on the basis of consumer characteristics with the use of a stepwise, canonical discriminant analysis. Results indicate that both discriminant functions are statistically significant ($p = .0064$ and $p = .0316$ for functions 1 and 2, respectively). Reallocation of the subjects to the segments using the discriminant functions results in a classification accuracy of 61.1 percent, which is significantly higher than the chance criterion of 37.6 percent. In Figure 2, the segments and the consumer characteristics that entered into the two discriminant functions are graphically portrayed in a two-dimensional space. In this figure, dots represent the position of the three segments and arrows represent consumer characteristics and point in the direction of the segment for which the consumer characteristics are most applicable.

Figure 2 shows that the three segments differ with respect to four out of five involvement components. The scanning segment (S1), for instance, considers shampoo a relevant, but low-risk product (a mean score of 3.3 for S1 vs. 4.0 and 3.9 for S2 and S3, respectively), which coincides with the subjects' limited attention for only pictorial and headline. On the other hand, shampoo is a

relevant and pleasurable product for subjects belonging to the initial-attention segment (a mean score of 4.0 for S2 vs. 3.7 and 3.8 for S1 and S3, respectively), and they attend mainly to ad elements that might contain pleasurable brand-related information, namely, pictorial and packshot. In addition, the advertised brand attains a higher score on hedonic brand attitude with members of segment 2 and they are more familiar with brands of shampoo. The higher usage frequency combined with the higher risk involvement for the sustained-attention segment (S3) fits with their attention to the body text, since such verbal information is effective in reducing perceived risk. Members of segment 3 attend longer to the pages just before the target advertisement ("Prior gaze duration"; 4.3 seconds per page for S3 vs. 2.9 and 3.2 seconds for S1 and S2, respectively).

Finally, brand recall scores do ($\chi^2 = 8.057, p < .05$), but brand recognition scores do not ($\chi^2 = 2.166, p > .10$), differ significantly across the three segments. Recall scores are highest for the sustained-attention segment (33.3 percent), followed by the initial-attention segment (16.1 percent) and by the scanning-segment (7.4 percent).

CONCLUSION AND DISCUSSION

The latent class regression model demonstrates the importance of accounting for heterogeneity in determining the impact of physical ad properties on visual attention to advertising. By distinguishing three segments, the amount of variance in local gaze durations that the physical ad properties accounted for increases. Moreover, if subjects had been assumed homogeneous, the impact of most physical ad properties on local gaze duration would have been undetected. Therefore, the methodology contributes to a better understanding of the patterns of visual attention to advertising in real-world exposure situations, where those patterns, and therefore the impact of physical ad properties, differ among consumer segments.

In this study, we concentrate on local gaze duration for the elements of an advertisement as a measure of visual attention. Our results strongly suggest that the three segments of consumers that are identified have qualitatively different patterns of attention, which can be described as scanning, initial attention, and sustained attention. Differences in visual attention patterns among segments coincide with differences among the segments with respect to involvement, brand attitude, and ad recall. Whereas previous research has emphasized the relationship between a single involvement construct and advertising processing (e.g., Cacioppo, Petty, and Sidera 1982; Miniard et al. 1991; Yalch and Elmore-Yalch 1984), our results demonstrate that different components of involvement (see, e.g., Jain and Srinivasan 1990; Laurent and Kapferer 1985) differentially affect visual attention patterns.

Although the differences in average local gaze duration among the three segments suggest that the dominant sequence of attention is (1) headline and/or (2) pictorial, (3) packshot, and (4) body text, support for this contention can only come from analyses of eye fixation sequences. Research on eye fixation sequences and on the antecedents and consequences of particular eye fixations may also be used to determine the correspondence between visual attention patterns and higher-order cognitive processes (Russo 1978; Russo and Leclerc 1994).

On the basis of the longer time that the sustained-attention segment spent leafing through the pages close to the target advertisement, we conclude that subjects in this segment remain more involved either in the magazine itself or in the experimental task. Both the visual attention patterns for the target ad and the information from the profile of consumer characteristics indicate that the former is the case. In situations in which the latter occurs, researchers using eye-tracking equipment should account for the fact that a proportion of the subjects remains task-involved throughout the complete task and therefore pays more attention to the target ad. According to Janiszewski and Warlop (1993), results of behavioral research under such procedural constraints are most applicable when they concern natural settings. In line with their argument, we have tried to maximize the degree of realism of the exposure situation.

In conclusion, advertisers may use our methodology to improve their understanding of the impact that physical ad properties and consumer characteristics have on patterns of visual attention to advertising. The results in the empirical illustration warn against formulating general hypotheses regarding those effects, and they underscore the importance of specifying and appropriately modeling the consumer characteristics that account for heterogeneity in visual attention to advertising.

[Received October 1995. Revised January 1997. Brian Sternthal served as editor and Joseph W. Alba served as associate editor for this article.]

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